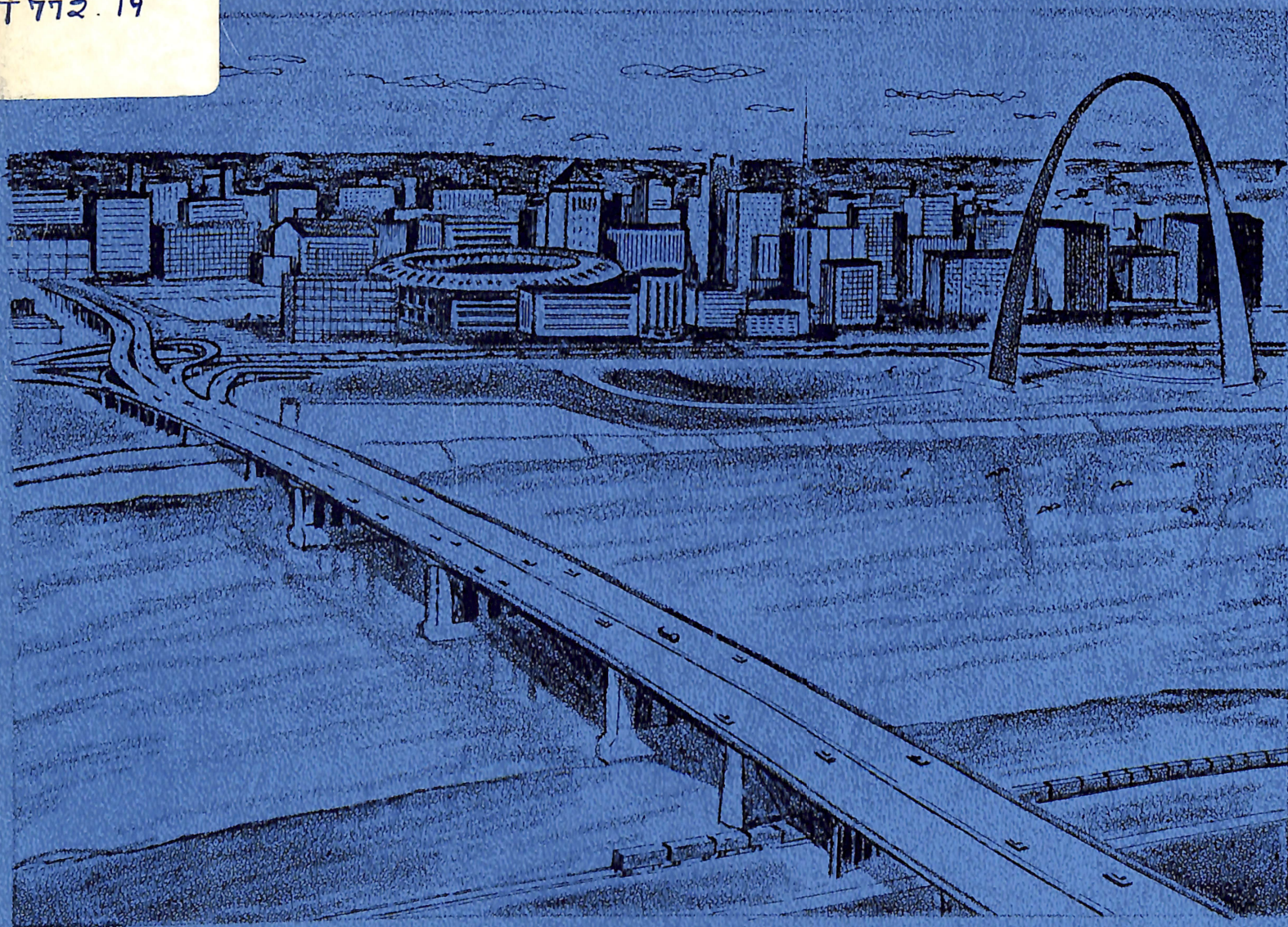


ST. LOUIS AREA TRANSPORTATION STUDY

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BACKGROUND INFORMATION ON THE BASIC DATA

prepared by
ILLINOIS DIVISION OF HIGHWAYS
MISSOURI STATE HIGHWAY COMMISSION

in cooperation with
EAST-WEST GATEWAY COORDINATING COUNCIL

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PREFACE

This is the preface to a series of reports to be released periodically. The objective of these reports is to keep members of the East-West Gateway Coordinating Council informed concerning the development of the study as each phase is completed.

This informational report explains the methods used to obtain the necessary field data and the processing of the data after it was collected.

The specific functions presented in this report include: (1) Sample Selection; (2) Data Collection; (3) Data Processing; and (4) Editing the Data for Accuracy.

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INTRODUCTION

Some may raise the question, "What is the purpose of the St. Louis Area Transportation Study?"

First, and most important, the transportation study will provide vital information needed for the orderly and economical development of transportation facilities in the St. Louis area. Certainly, before there can be orderly planning, there must be available adequate data from which a plan can be devised. Data being gathered in the study will be used to determine the public's travel desires and needs, therefore permitting establishment of the goals necessary for serving the transportation requirements of the people.

Second, the transportation study is a requirement of the 1962 Federal Aid Highway Act enacted by Congress and signed into law by the President. Briefly, the law states that all metropolitan areas with 50,000 or more population must have in effect a co-operative, comprehensive and continuing transportation planning process. The penalty for failing to comply is the cutting-off of federal aid highway funds for that entire area.

Creation of the East-West Gateway Coordinating Council--embracing St. Louis City and St. Louis, Jefferson, and St. Charles Counties in Missouri and St. Clair, Madison and Monroe Counties in Illinois--paved the way for a planning process in the St. Louis Area.

In early 1965, the first fruitful framework of the St. Louis Area Transportation Study began to evolve. The Missouri State Highway Department, Illinois Division of Highways, the Bureau of Public Roads and local agencies joined hands in cooperative effort to get the study under way.

The summers of 1965 and 1966 saw the St. Louis area busy with the field activities of the two State Highway Departments. Scores of people were busy collecting data in home interviews with residents. Dozens of others were gathering information from highway travelers at roadside interview stations. Street intersections were measured, turning traffic movements were recorded, travel times were determined and machine traffic counts were taken.

At the same time, the program of data collection was being reviewed carefully by the Bureau of Public Roads to guarantee that comprehensiveness was not being neglected.

THE STUDY AREA

The area designated for detailed study as part of the St. Louis Area Transportation Study is shown on Figure 1. The boundary surrounding this area is known as the cordon line and was established on the basis of anticipated urbanization.

The cordon line circumscribes an area of 1,673 square miles. It is within this area that home interviews, truck and taxi interviews, and street inventories were conducted. Also conducted were vehicle turning movement counts, classification counts, and vehicle volume counts.

The roadside interview stations were located at the cordon line. Home interviews were not conducted outside the cordon line because the necessary information for this area was obtained from roadside interviews.

SAMPLE SELECTION

DWELLING UNIT SAMPLING

Before the field work involving data collection could begin, the sample size, or number of interviews, and a means of obtaining the sample addresses had to be determined. In selecting the source and size of the sample, it was necessary to choose the best means of assuring proper geographical distribution of interviews and a percentage of sample that would insure the desired degree of accuracy in the analyses to follow.

In the St. Louis Area Transportation Study, the "dwelling unit" or "place of residence" was used as the basis for sampling. The method of selection and size of the sample varied according to area. Two general types of residential areas are depicted in Figures 2 and 3.

In St. Louis City, a 3 per cent sample was selected. "Census Block" statistics were used to locate the particular blocks in which samples were to be selected. These blocks were located on maps from which actual sample addresses were then determined.

A 3 per cent sample also was selected in St. Louis County. Utilizing computerized county real estate tax records, it was possible to maintain good geographical control of the sample.

Field sampling was used in selecting the samples for St. Charles City, St. Charles County and Jefferson County. Since these areas are less densely populated, a 5 per cent sample was chosen.

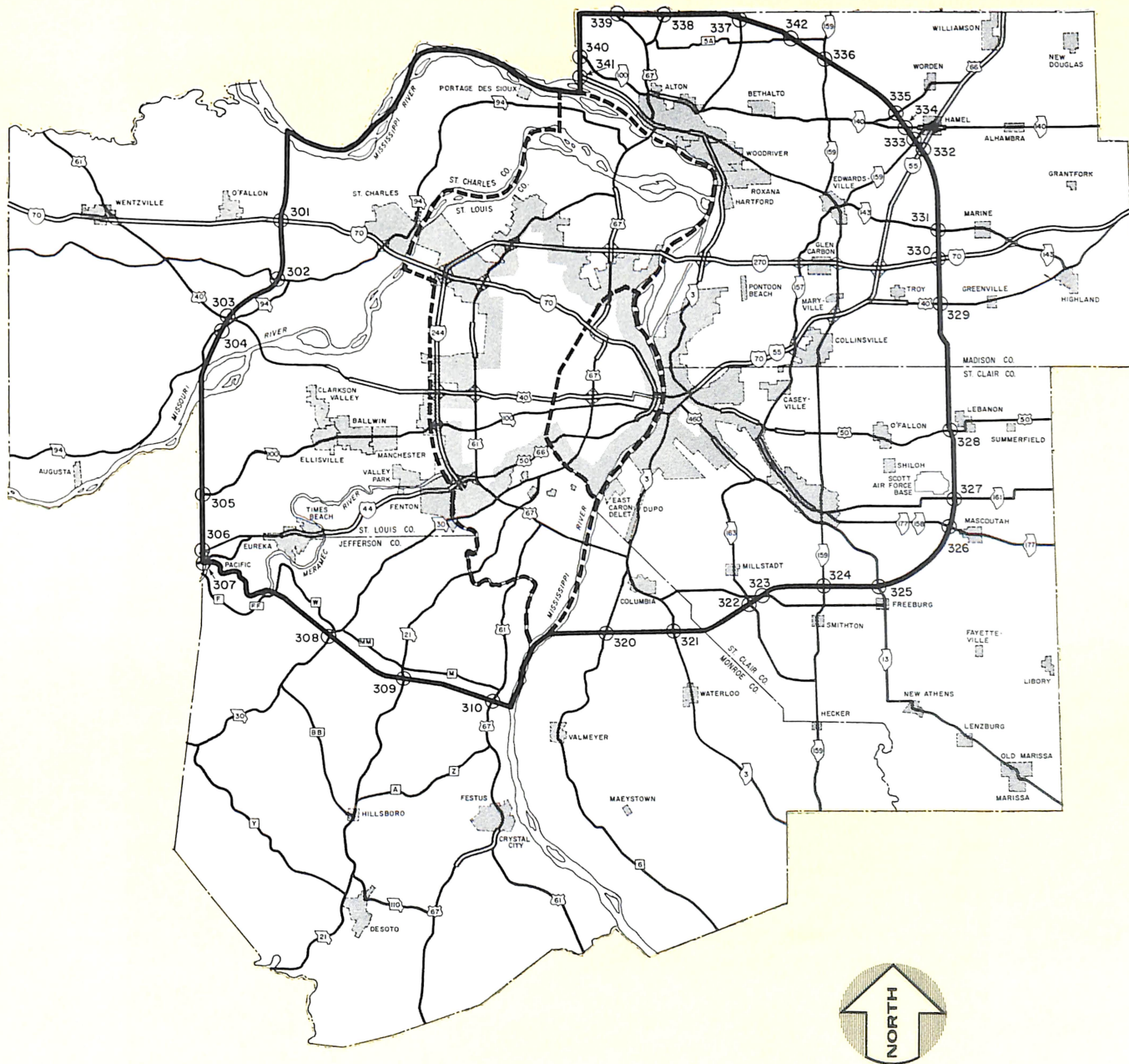


FIGURE I

In Illinois, a 3 per cent sample was selected through use of commercial listings, supplemented by field selection.



FIGURE 2 -- Urban Residential Area -- Low Density

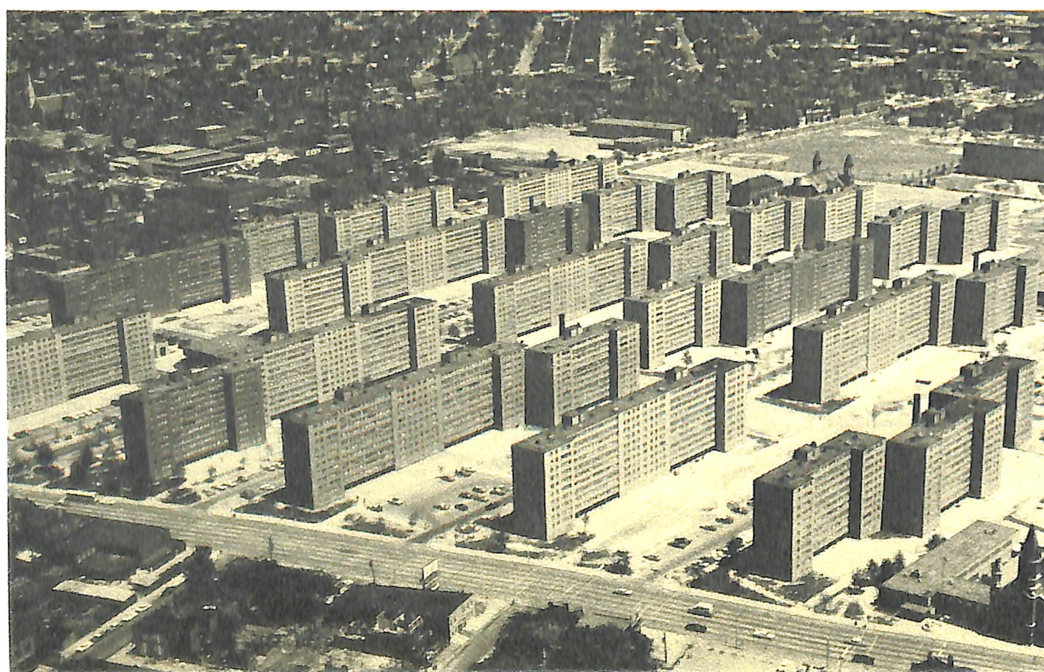


FIGURE 3 -- Urban Residential Area -- High Density

The following is a breakdown of the number of samples selected by area.

<u>LOCATION</u>	<u>NO. OF SAMPLES</u>
St. Louis City	7, 930
St. Louis County	6, 957
St. Charles City	417
St. Charles County	270
Jefferson County	591
St. Clair County	2, 320
Madison County	2, 135
Monroe County	<u>55</u>
TOTAL	20, 675

TRUCK SAMPLING

All trucks based in the area, except those operated by government agencies, were sampled from computer listings provided by the Department of Vehicle Registration in each of the states. The trucks operated by government agencies were sampled using listings obtained from the various governmental agencies which operate vehicles inside the study area.

Truck samples were divided into two categories, light trucks and heavy trucks. The distinction of categories was based on licensed capacity. For practical purposes, the light truck category pertains to pickup and panel trucks.

The detailed statistics pertaining to truck sampling are contained in the following summary:

LIGHT TRUCKS

<u>LOCATION</u>	<u>TOTAL REGISTERED</u>	<u>NO. OF SAMPLES</u>
Missouri	24, 438	1, 000
Illinois	<u>16, 837</u>	<u>615</u>
Totals	41, 275	1, 615

HEAVY TRUCKS

<u>LOCATION</u>	<u>TOTAL REGISTERED</u>	<u>NO. OF SAMPLES</u>
Missouri	25, 621	2, 547
Illinois	<u>6, 753</u>	<u>493</u>
Totals	32, 374	3, 040

TAXI SAMPLING

In order to select taxi samples, it was necessary to determine how many taxis operate in the study area. This was done by contacting all taxi firms and requesting the number of taxis which were being operated.

A total of 1,707 regular taxis, 84 service cars and 15 airport limousines operate in the study area. From this total, 224 samples were selected for interviewing.

EXTERNAL (ROADSIDE INTERVIEW) STATIONS

Sampling for external (roadside interview) stations was a multi-step process.

The first step determined which roads were to be selected for roadside interviews. The second step determined the sample rate and the length of time each interview station was to be operated. The third step was accomplished during actual interview operations. It is in this step that the interview samples were selected.

In order to select the roads on which interviews were to be made, machine traffic counts were taken on every highway which crossed the Cordon Line. Those roads which accounted for 95 per cent of the vehicles crossing the cordon line were selected for interview station locations; the minor routes which had very low traffic were not interviewed because their traffic had little effect on the travel activity in the entire area.

The criteria recommended by the Bureau of Public Roads was used to determine the number of hours each interview station was operated. All stations must be open for at least 16 hours. Those stations having 500 or more vehicles crossing the cordon line between 10:00 pm and 6:00 am must be operated on a 24-hour basis. The percentage of motorists to be interviewed is determined by the volume of travel through the station. The sampling criteria was developed by the Missouri State Highway Department.

The duration and number of interviews as well as the number of vehicles passing through each station during the hours of interview are shown in the following table. For station locations see Figure 1.

<u>STATION NUMBER</u>	<u>TOTAL HOURS INTERVIEWED</u>	<u>NUMBER OF INTERVIEWS</u>	<u>VEHICLES PASSING (BY MANUAL COUNT)</u>
301	24	4,522	16,369
302	16	713	749
303	24	1,893	5,083
304	16	963	1,855
305	16	864	924
306	24	3,631	13,359
307	24	3,187	3,496
308	24	1,659	4,100
309	24	1,740	5,688
310	24	3,786	14,722
320	16	361	492
321	24	3,662	6,674
322	16	737	922
323	16	772	1,032
324	24	3,095	4,165
325	24	3,831	8,177
326	24	3,425	4,362
327	24	3,327	4,445
328	24	4,178	6,940
329	24	2,914	4,280
330	24	3,667	9,325
331	16	1,020	1,235
332	24	3,871	13,420
333	16	1,489	1,807
334	16	1,455	2,061
335	16	393	483
336	16	2,006	2,593
337	16	798	1,020
338	24	3,433	5,122
339	24	3,012	4,432
340	16	1,145	1,430
341	24	2,364	4,317
342	16	385	476
TOTALS	680	74,298	155,555

DATA COLLECTION

PERSONNEL EMPLOYED

To collect the enormous amount of data required in the St. Louis Area Transportation Study, it became apparent in the initial stages of preparation that more personnel would be required than was readily available within the two State Highway Departments. To meet the demand, it was decided that adequate full time supervisory personnel would be sent to the field from the highway departments and all other personnel would be teachers and college students from the St. Louis Area.

Initially a total of 135 persons was hired. Of these, 101 were used for the various phases of the internal study and 34 were used in the external study. During the period of data collection, it was necessary to hire 44 replacement personnel for the internal study and 18 for the external study.

PERSONNEL TRAINING

Prior to the actual work assignments, a short period of training was given to all summer personnel working on the various study phases.

For each type of interviewing, a manual of instructions was prepared to guide the interviewer and to aid in his orientation to the work.



FIGURE 4 - Interviewer Instruction Session

During the orientation period, interviewers were guided through various examples of data which could be expected to be obtained from an interview. Upon completion of the orientation, the interviewers were sent out on a limited number of practice interviews. When these were completed, the work was carefully scrutinized by experienced personnel. Any errors in interviewing were pointed out and discussed (figure 4), with each interviewer being further instructed on those points which he apparently did not grasp during the orientation.

AIDS FOR INTERVIEWERS

Each interviewer was given an identification card and a letter of introduction. Prior to his arrival for an interview, a letter was sent to the occupants of the sample address stating that an interviewer would arrive in the near future to obtain information about their travel. The advance letter was extremely important in helping the interviewer to gain admission to the home.

DWELLING UNIT INTERVIEWING

Of all the field work necessary in a transportation study, home interviewing is probably the most difficult, the most personal in nature and the most vital. It is from this information that the area's trip characteristics are developed. Without interviews, no reasonable estimate of future travel can be made.

During the summers of 1965 and 1966, a total of 20,275 home interviews were made. Of this total, 15,765 were taken in Missouri and 4,510 in Illinois.

All interviews were checked during field operations. It was important to check first assignments of each interviewer thoroughly for completeness. It also was necessary that quality control checking be continued for the duration of the interviewing period, since interviewers were then available to clarify questionable items. If they were unable to clarify them, it was still possible to make a phone call to the sample household to secure the necessary information.

PLANNING QUESTIONNAIRE

Collecting information concerning transportation was, of course, the primary objective during this period of data collection. However, there are other types of information which are desirable when considering the overall picture.

Of great importance to any community is the attitude of its citizens concerning facilities and services provided by the cities and counties, as well as the likes and dislikes of immediate neighborhoods concerning their

environment. Information on citizen attitudes can be a useful tool in molding future development in a manner which is pleasing to the public. Figures 5, 6 and 7 show some of the variation in community facilities and environment within the St. Louis Area.

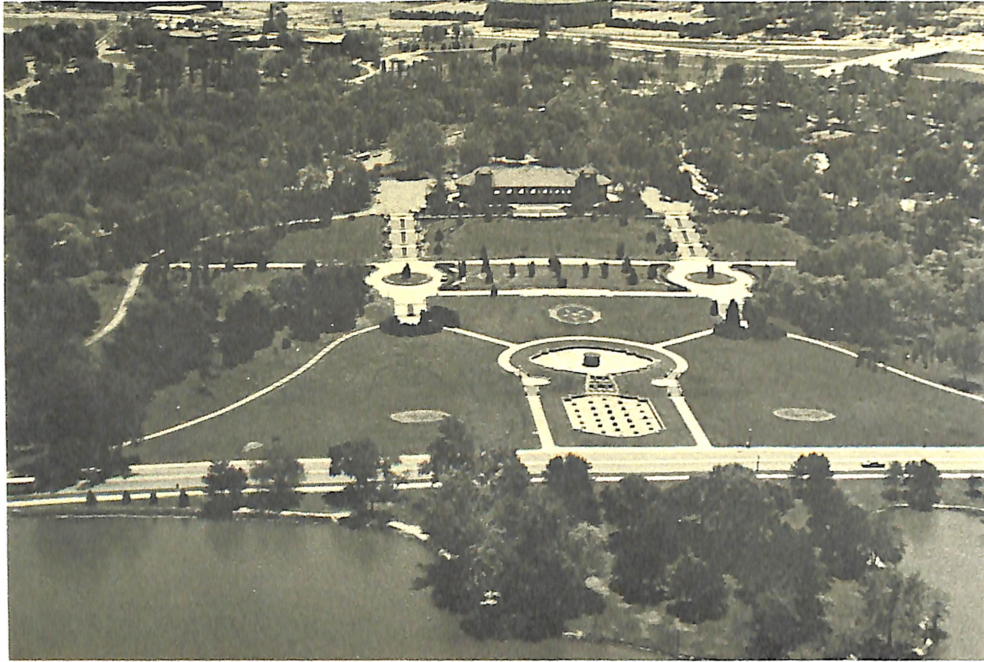


FIGURE 5 - Example Of Area Environment

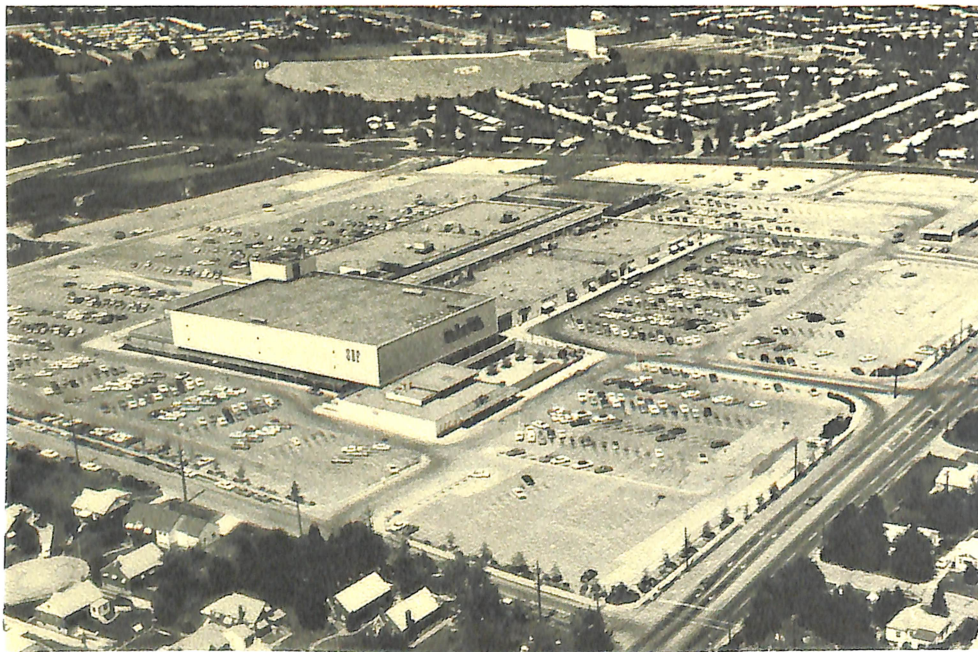


FIGURE 6 - - Example Of Area Environment

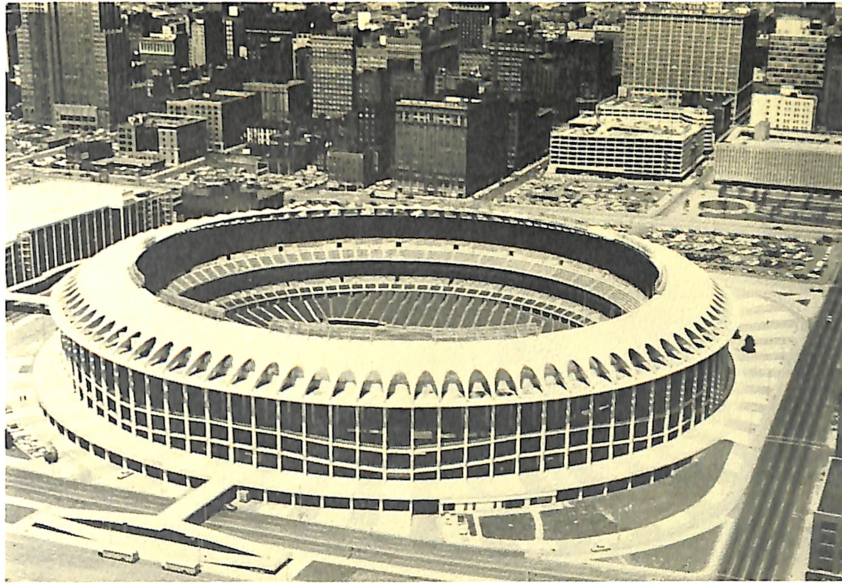


FIGURE 7 - - Example Of Area Environment

To obtain citizen attitude information in the St. Louis area, a planning questionnaire was left at each sample address where a home interview was obtained. The form contained sufficient instructions to enable the home owner to supply the desired information. Upon completion, the form was to be returned to the respective Highway Department by mail for later detailed study.

TRUCK INTERVIEWING

A total of 4,647 truck interviews was taken during the survey, including 3,539 in Missouri and 1,108 in Illinois.

One of the major problems in collecting truck data was locating the information for a particular sample. In the case of trucks owned by large firms, the most efficient way to obtain the information was through the dispatcher. To get the needed data from small firms or trucks which were privately owned, it was usually necessary to talk to the driver who drove the truck on the day in question and it was difficult at times to locate these drivers.

TAXI INTERVIEWING

Taxi interviewing was probably the easiest of all operations performed. Due to the small number of interviewers required for this purpose, it was possible to assign the best personnel to the job. A total of 202 interviews were taken in Missouri and 22 in Illinois.

ROADSIDE INTERVIEWING

Roadside interviewing (see figure 8) was conducted at the cordon line on the 33 major routes leading into the study area. These interviews, each about 60 seconds long, were designed to account for that travel which comes into, passes through, or leaves the study area. Also, it is these interviews which record the interaction between the study area and other population centers.

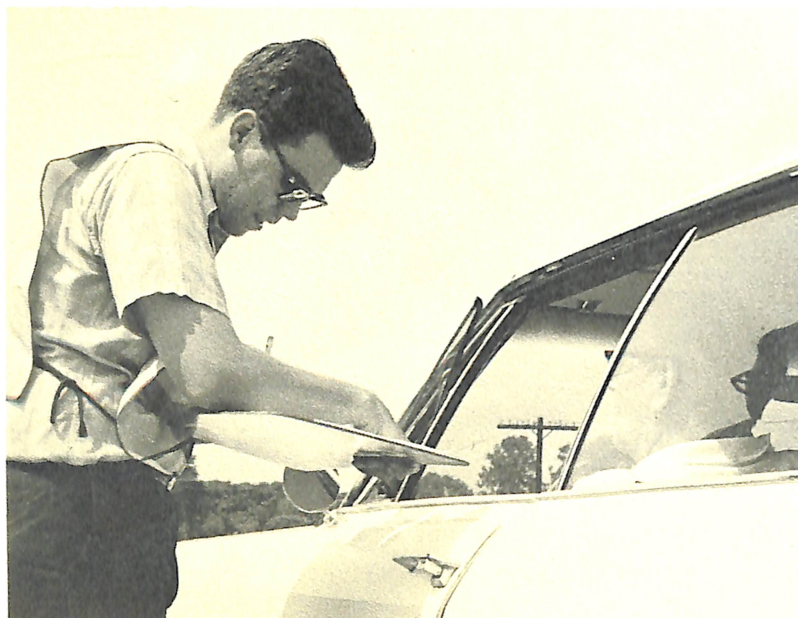


FIGURE 8 - - A Roadside Interview

In order to properly project trip data, each roadside interview station location was machine counted twice for 24 hours each. Stations were counted once prior to interviewing in order to select the routes to be interviewed and once during the actual period of interview.

STREET INVENTORY - MANUAL COUNTS - VOLUME COUNTS

Besides collecting data concerning travel, it also was necessary to collect data which can be used to analyze the existing roadways to determine their traffic handling capabilities. Street intersections restrict the flow of traffic because of stop lights, turning vehicles and many other reasons. Therefore, the capacity of key intersections must be determined to see if they are capable of handling present and future traffic without causing great delay to motorists.

Because of sheer numbers not all street intersections in the area can be analyzed. In choosing intersections to be analyzed, it was decided to select those formed by routes carrying the largest volumes of traffic in the area.

A total of 899 intersections fell into this category and these were inventoried. At these same intersections, manual classification counts and turning movements were conducted. A total of 1,726 twenty-four hour volume counts were made to determine route volumes.

SPEED - DELAY

Our world is very time conscious - so time conscious, in fact, that in choosing between two routes a traveler usually is concerned with the difference in travel time between them rather than the distance. It is in travel time that almost all driving conditions of a particular route are best described.

Later in the transportation study, time will be one of the elements used in assigning travel between two points on a particular route. In view of this requirement, 1,760 miles of roads considered to be of major significance to the area were driven to determine the average driving time on each. This, of course, will be converted to average driving speed. Most routes were driven three times with one time being during the peak hour of travel.

SCREENLINE AND CLASSIFICATION COUNTS

Just as any theory must be laboratory tested, the number of expanded trips developed from interview data must also be tested for accuracy. The degree of accuracy is determined by count volumes taken at the screenlines (shown on Figure 1) to find the number of vehicles crossing them on an average weekday. These counts are further classified by the number of autos, pickups and panels and other trucks crossing these screenlines on an average weekday. If the expanded trips crossing the same screenlines total near the actual count values, the degree of accuracy is considered good.

In order to gather the information to be used in checking expanded trips developed from interview data, it was necessary to machine count each road and street which crossed the screenlines for a period of 48 hours on two separate occasions.

A total of 314 forty-eight hour machine counts were made at the screenlines. At 128 locations, 16 hour counts were conducted for the purpose of classifying vehicles.

DATA PROCESSING

After the data was collected, it was necessary to translate the verbal information into coded form for data processing. After coding, the

information was punched into data processing cards.

The most significant adjustment from the interview data to the coded form involved the address of the interview and the trip end points of the travel. All addresses within the study area were coded to block numbers. All locations outside the study area were coded to coordinates of longitude and latitude, external zone or county, and state.

The block coding system used was a combination of assigned block numbers outside the St. Louis city limits and those block numbers appearing on the official city map for the City of St. Louis for the year 1965.

All O-D data inside the study area was coded using a 7-digit block number system. With this 7-digit number it was possible to utilize the one and two character alphabetic suffixes that are commonly attached to block numbers in St. Louis City.

The first digit of the 7-digit block numbering system (by area) is as follows:

1. A (0) was used for the study area in Missouri which lies outside St. Louis City.
2. A (2) was used for St. Louis City.
3. A (3) was used for that portion of the study area which lies in Illinois.

By keeping the first digit unique, it was possible to use the same numbers in each of the above mentioned areas. This also shortened the block numbers as they actually appear on the maps that were used for coding.

The last two digits of the 7-digit system also were unique by area. They are as follows:

1. A (00) was used for the entire study area outside St. Louis City.
2. In St. Louis City the last two digits also were (00) when no alphabetic suffix was involved. When a single suffix such as (N) was involved, the last two characters in this case became (NO). When a double suffix such as (NW) was involved, the last two characters in this case were (NW).

Following is an example of how a block number appeared on a map and how it was coded as a 7-digit number.

<u>BLOCK NO. ON MAP</u>	<u>MO. OUTSIDE ST. LOUIS CITY</u>	<u>ST. LOUIS CITY</u>	<u>ILLINOIS</u>
36	0003600	2003600	3003600
927	0092700	2092700	3092700
5242	0524200	2524200	3524200
1024W	*	21024W0	*
1564AB	*	21564AB	*

* A block number with an alphabetic suffix is not found in these areas.

EDITING THE DATA FOR ACCURACY

After the interviews had been coded the information was punched into data processing cards. It was then necessary to edit the punched cards to detect any invalid codes. While it is impractical to check each code for its exact value, it is possible to determine whether a code lies within the valid range.

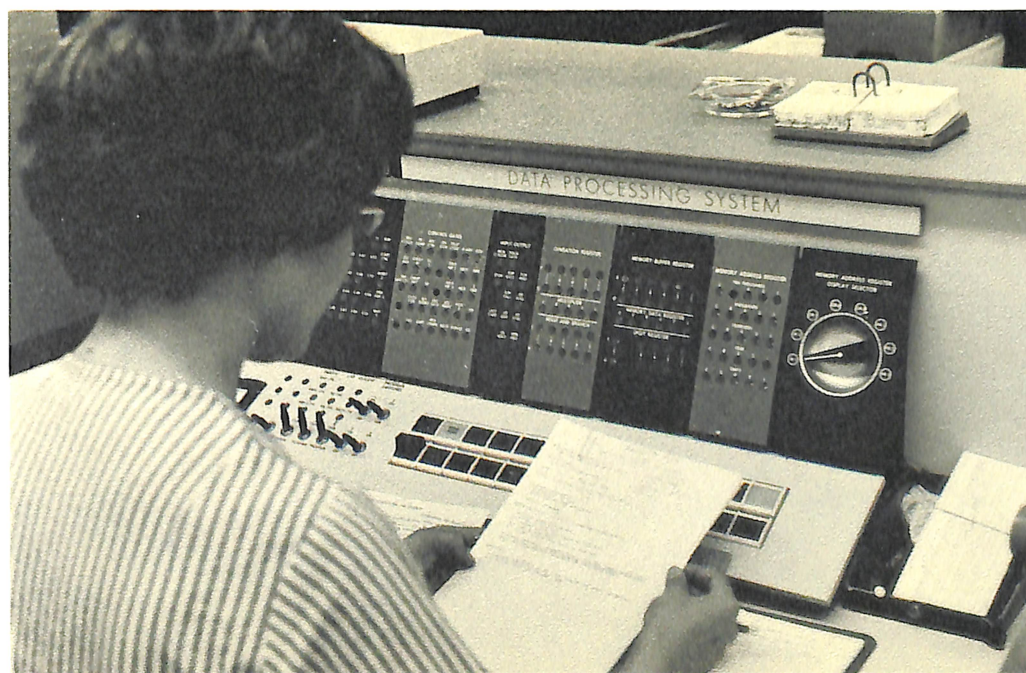


FIGURE 9 - Electronic Computer Operating Console

Before editing, all information contained in cards was transferred to magnetic tape and sorted using an electronic computer. Figure 9 depicts one type of electronic computer. Actual editing was performed on each type of card separately by means of a universal editing program developed by the Missouri State Highway Department, which permitted the comparison of the information in the punched card against the known ranges of numbers for the information.

If the information passed all tests it was automatically transferred to another magnetic tape. Information which failed to pass any tests was displayed along with messages indicating the tests which the information failed. This information was corrected, repunched, and edited again. This process was continued until all information was transferred to magnetic tape without any errors. After all information had passed all of the editing tests, the completed tapes were merged. The end result was one edited tape for each of the data card types.

SUMMARY

Having completed the sample selection, data collection, data processing and editing for accuracy, work on the study now will be concentrated on verifying the completeness of the information collected. After the verification process is completed, actual analysis of the data will begin.

Later reports will present information on the various phases of the study as they are completed.

APPENDIX

The following is a list of the forms and manuals of instruction used in the study to date.

1. Manual of Instructions for Dwelling Unit Sampling
2. Manual of Instructions for Home Interviewers
3. Manual of Instructions for External Interviewers
4. Manual of Instructions for Internal Truck Interviewers
5. Manual of Instructions for Internal Taxi Interviewers
6. Letter of Intent - Home Interview
7. Letter of Intent - Truck Interview
8. Letter of Intent - Taxi Interview
9. Dwelling Unit Interview Form
10. Internal Trip Report Form
11. External Trip Report Form
12. Truck Interview Form
13. Taxi Interview Form
14. Planning Questionnaire
15. Family Income Categories
16. Dwelling Unit Interview Assignment Record
17. Dwelling Unit Interview Progress Report (Personal)
18. Dwelling Unit Interview Progress Report (Total)
19. Progress Report for External Stations
20. Progress Report for Truck Interviews
21. Progress Report for Taxi Interviews
22. Street Inventory Form for Capacity Study
23. Classification Tally Form (Intersection)
24. Traffic Classification Sheet (External Station and Screenline)
25. Field Form for Travel Time Study (Speed Delay)
26. Recommended Sample Size for External Stations
27. Coding Instructions - Dwelling Unit Interview
28. Coding Instructions - Internal Trip Report
29. Coding Instructions - External Trip Report
30. Coding Instructions - Truck Interview
31. Coding Instructions - Taxi Interview
32. Coding Supplement No. 1 - Internal Trip Locations
33. Coding Supplement No. 2 - External Trip Locations